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LLNL-TR-412420

DOECGF 2009 Site Report: Lawrence Livermore National Laboratory

E. Brugger, R. R. Springmeyer

April 22, 2009

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This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

DOECGF 2009 Site Report:

Lawrence Livermore National Laboratory

Site Name:

Lawrence Livermore National Laboratory

Site Division or Group:

Computation: Data Group, Information Management and Graphics Group, CASC

Site Representative:

Computation: Data Group, Information Management and Graphics Group, CASC

Site Representative Address:

P. O. Box 808, L-561, Livermore, CA 94550
Eric: (925) 423-1293, brugger1@llnl.gov
Becky: (925) 423-0794, springme@llnl.gov
Fax: (925) 423-6961

Mission:

The Data group provides data analysis and visualization support to its customers. This consists primarily of the development and support of VisIt, a data analysis and visualization tool. Support ranges from answering questions about the tool, providing classes on how to use the tool, and performing data analysis and visualization for customers.

The Information Management and Graphics Group supports and develops tools that enhance our ability to access, display, and understand large, complex data sets. Activities include applying visualization software for terascale data exploration; running video production labs on two networks; supporting graphics libraries and tools for end users; maintaining PowerWalls and assorted other displays; and developing software for searching, managing, and browsing scientific data.

Researchers in the Center for Applied Scientific Computing (CASC) work on various projects including the development of visualization techniques for terascale data exploration that are funded by the ASC program, among others. The researchers also have LDRD projects and collaborations with other lab researchers, academia, and industry.

Past Year's Activities:

The IMG group is located in the Terascale Simulation Facility, home to BGL, Dawn, Purple, and Atlas, which includes both classified and unclassified visualization theaters, a visualization computer floor and deployment workshop, and video production labs. We continued to provide the traditional graphics group consulting and video production

support. We maintained five PowerWalls and a host of other displays. We support a 128-node Opteron/IB cluster providing a visualization production server for our unclassified systems and a 256-node Opteron/IB cluster for the classified systems, as well as several smaller clusters to drive the PowerWalls. The unclassified visualization production system includes a 150 TB NFS server to provide dedicated storage for data analysis and visualization. This year we updated projectors for one of the PowerWalls and acquired new fiber modems for another.

The ASC projects have delivered new versions of visualization and scientific data management tools to end users and continue to refine them. VisIt had 5 releases during the past year, ending with VisIt 1.11.2. We released version 2.2 of Hopper, a Java application for managing and transferring files. This release included a built-in file comparison package, extensive additions to the Help options, and miscellaneous additions to improve the user experience or better leverage resources.

We continue to use and develop Blockbuster and Telepath. Both the VisIt and IMG teams were engaged in a variety of movie production efforts during the past year in addition to the development tasks.

Information on these tools and efforts can be found on our PPPE web pages http://www.llnl.gov/icc/sdd/img/infrastructures.shtml and at the VisIt site: https://visit.llnl.gov.

The CASC researchers participated in a variety of activities:

- developed and published new techniques for material boundary extraction with John Anderson and published the result at Eurovis.
- continued collaboration on novel methods to visualize multi-group radiation transport data.
- developing a new streaming topological analysis code-base that allows computation of merge and split trees. These trees enable analysis of the global behavior of every isocontour in a simulation data set.
- developed and transitioned lossless floating point compression technology to the Silo team.
- advanced the state of the art in scalable isplay of billion-atom particle simulation data.
- contributed to high-profile visualization and analysis of billion-particle atomistic simulations relevant for high-energy density physics applications.

Plans and Priorities:

During the current fiscal year we plan to purchase a new visualization cluster for our classified network. We are still gathering requirements and evaluating technologies before we make decisions on the next architecture. We plan no major technology refreshes for our visualization theaters in the next year.

We will release new versions of the various in-house tools we support. We will continue to provide consulting and support services in graphics and video production.

Research into visualization techniques continues, funded largely by sources other than the ASC program. The research priorities for next year are topological analysis for scientific computing, particle visualization, data compression, and mentoring students in various areas related to the above.

Funding Source:

The IMG Group is funded by ASC as well as other "institutional" sources.

CASC is funded by LDRD, ASC, and outside sponsors.

The Data group is funded by ASC, SciDAC, Advanced Fuel Cycles Iniative, and other outside sponsors.

Current Hardware Platforms:

Compute servers: See http://www.llnl.gov/computing/hpc/resources/ for details on the compute servers and storage systems.

Production visualization servers: We have one unclassified and one classified production visualization server, three classified PowerWalls with dedicated clusters to drive them, and two unclassified PowerWalls with dedicated clusters to drive them.

Gauss Linux production cluster:
256 nodes (Dual 2.4 GHz Opteron, 12GB RAM), InfiniBand, nVidia Quadro 4500, shared Lustre disk

Prism Linux production cluster:
128 nodes (Dual 2.4 GHz Opteron, 16GB RAM), InfiniBand, nVidia Quadro 5500, shared Lustre disk, dedicated NFS storage for data analysis and visualization

Video production: Our two labs include PCs, Macs, desktop video editors, and assorted recorders, monitors, mixers, and software packages.

Visualization developer's lab: Assorted small systems and a 15-panel display driven by multiple Linux clusters.

Desktop systems for visualization consist of diskless and diskfull Linux, Mac and Windows systems, with Linux the being the most common followed by Mac and Windows.

Current Software:

VisIt, EnSight, IDL, Tecplot, AVS, assorted other utilities and translators, and Blockbuster. SDM software includes Hopper, Chopper, and tools used in the Green Data Oasis.

Blockbuster: http://blockbuster.sourceforge.net/

Hopper: https://computing.llnl.gov/resources/hopper/
VisIt: https://visit.llnl.gov

Current Staff:

In the Information Management and Graphics Group of Livermore Computing there are 9 people, including three developers working on scientific data management tools. The remaining 6 people provide graphics consulting, support for displays, video production assistance, visualization and analysis support, and visualization hardware architecture planning and procurement.

In the DATA group there are 6 people supporting VisIt.

In CASC there are 6 visualization researchers.

Upcoming Hardware Platforms:

None.

Upcoming Software:

Additional licenses for commercial software as needed.

Upcoming Staff:

No hiring planned for the next fiscal year.